Remarks

Claims 1-20 are pending.

Claim 1 has been amended to particularly point out and distinctly claim Applicant's invention. One instance of the word "with," which the Examiner considered to be indefinite, has been deleted. Claims 14 and 20 have been similarly amended.

Rejections under 35 U.S.C. § 112, ¶2

The Examiner rejects Claims 1 and 14 as being indefinite on the ground that a "bimetal" is a structural element "which cannot include [a] temperature".

As employed in the Application, the term "temperature" means, for example, "the degree of a material substance that is a linear function of the kinetic energy of the random motion of its molecules". Webster's Third New International Dictionary, p. 2353 (1993).

A "bimetal" is a structure formed of material substances, which include molecules having kinetic energy. It is submitted that it is clear, therefore, that a bimetal includes a temperature. Accordingly, it is submitted that the portions of Claims 1 and 14, which recite temperature, are definite and pass muster under Section 112, second paragraph.

The Examiner also rejects Claims 1 and 14 as being indefinite on the ground that the meaning of one instance of "with" is not clear. The Examiner considers this to be a typing error.

Claims 1 and 14 have each been amended to delete the single instance of "with" that the Examiner considered to be unclear.

Accordingly, it is submitted that Claims 1 and 14, as now presented, are definite and pass muster under Section 112, second paragraph.

Although not rejected by the Examiner, Claim 20 included a similar recital of "with". Accordingly, Claim 20 has also been amended to delete the single instance of "with" that the Examiner considered to be unclear.

Rejections under 35 U.S.C. § 103(a)

Claims 1-7 and 9-20 are rejected as being unpatentable over U.S. Patent No. 5,691,869 (Engel et al.) in view of U.S. Patent No. 5,070,932 (Vlasak) in view of "Application Notes from Alpha Sensors, Inc." (Alpha).

Engel et al. discloses a circuit breaker 3 including a line conductor 5 and a neutral conductor 7 connected to provide power to a load 9. Separable contacts 11 can be tripped open by a spring operated trip mechanism 13, which may be actuated by a conventional thermal-magnetic overcurrent device 15. This thermal-magnetic overcurrent

device 15 includes a bi-metal 17 connected in series with the line conductor 5. Persistent overcurrents heat up the bi-metal 17 causing it to bend and release a latch 19 which actuates the trip mechanism 13. Short circuit currents through the bi-metal 17 magnetically attract an armature 21 which alternatively releases the latch 19 to actuate the trip mechanism 13. In addition to the thermal-magnetic overcurrent device 15, which provides conventional protection, the circuit breaker 3 also includes an arcing fault detector 23.

Vlasak discloses a room thermostat 110 including a bi-metal member 37, which actuates a mercury switch 38 that is movable between a first stage cooling contact 40 and a first stage heating contact 42. Connected in series with a supplemental heat relay 56 is a second stage heat anticipator 58, which cooperates with a second stage heat bi-metal 60 that actuates a mercury switch contact 61. An ambient compensating thermistor 70 is electrically connected in series with an outdoor ambient resistor 72. The outdoor ambient resistor 72 is thermally linked to the thermostat bi-metal members 37,60. The ambient compensating thermistor 70 is normally a negative temperature coefficient (NTC) thermistor that is physically located within the outdoor ambient air and responds to changes in the outdoor ambient. The thermistor 70 provides a control for the fixed resistor 72 to help provide little anticipation heat at low outdoor temperatures and significant anticipation heat at high outdoor temperatures. The series electrical combination of the thermistor 70 and the fixed resistor 72 is electrically powered by a 24 VAC transformer 12.

Figure 7 of Vlasak shows a variable resistor 282, which is adapted to be set upon rotation of a knob of a potentiometer 82, and a positive temperature coefficient (PTC) thermistor 284 in series therewith. The variable resistor 282 and the positive temperature coefficient thermistor 284 are in parallel with the fixed resistor 72.

Alpha (Figure 4) shows a circuit, which is also shown in (prior art) Figure 2 of the present Application. See page 3, lines 5-10 of the specification. Alpha discloses that a linear voltage output that varies with temperature can be produced by utilizing an operational amplifier and a linearized thermistor network. The voltage output decreases linearly as temperature increases. The circuit is calibrated by adjusting variable resistor R3 for an output voltage of 200 mV at 25°C and 0 V at 45°C.

Claim 1, as amended, recites a circuit breaker comprising: separable contacts; a latchable operating mechanism including a latch member which when released opens the separable contacts; a bimetal in series with the separable contacts and adapted for heating by current flowing therethrough, the bimetal including a temperature, a temperature coefficient, a first terminal, and a second terminal having a voltage, the bimetal being adapted to deflect

by the heating, the bimetal coupled to the latch member to release the latch member in response to a persistent overcurrent condition; and a trip assembly comprising: a thermistor adapted to respond to the temperature of the bimetal, an amplifier having a first input, a second input and an output, a first resistor electrically connected between the second terminal of the bimetal and the first input of the amplifier, a second resistor electrically connected in parallel with the thermistor, a third resistor electrically connected in series with the parallel combination of the second resistor and the thermistor, the series combination of the third resistor and the parallel combination of the second resistor and the thermistor being electrically connected between the first input of the amplifier and the output of the amplifier, the second input of the amplifier being referenced to the first terminal of the bimetal, the output of the amplifier having a voltage which is compensated for the temperature coefficient of the bimetal, means for providing a trip signal as a function of the compensated voltage, and means for releasing the latch member to trip the separable contacts open in response to the trip signal.

The references, whether taken alone or in combination, do not teach or suggest a trip assembly comprising, *inter alia*, a thermistor adapted to respond to a temperature of a bimetal, a first resistor electrically connected between a second terminal of such bimetal and a first input of the recited amplifier of Claim 1, a second input of such amplifier being referenced to a first terminal of such bimetal, an output of such amplifier having a voltage which is compensated for a temperature coefficient of such bimetal, and means for providing a trip signal as a function of such compensated voltage.

The Examiner states that Engel et al. does not disclose any thermistor, nor an amplifier with associated circuitry. For completeness, it is noted that this reference discloses that rectifier circuits 51,51′ include respective differential amplifiers 53,53′ formed by transistors 55 and 57. Also, the reference discloses that squared pulses are amplified by a current mirror 185 having an input transistor 187 and a pair of output transistors 189 and 191 so that a gain of two is applied to the squared pulses. Engel et al. clearly does not teach or suggest any thermistor, much less the recited thermistor and the recited amplifier of Claim 1.

Vlasak, which discloses an outdoor ambient resistor 72 that is thermally linked to thermostat bi-metal members 37,60 and that cooperates with an outdoor ambient compensating, negative temperature coefficient (NTC) thermistor 70, in order to provide relatively little anticipation heat to the thermostat bi-metal members 37,60 at low outdoor temperatures and to provide relatively significant anticipation heat to such bi-metal members 37,60 at high outdoor temperatures, teaches away from any thermistor adapted to respond to a

temperature of a bimetal. In complete contrast, the ambient compensating thermistor 70 is physically located within outdoor ambient air and responds to changes in such outdoor ambient air and cooperates with the fixed resistor 72, which heats the thermostat bi-metal members 37,60 as a function of the outdoor temperature. Clearly, Vlasak, which employs the thermistor 70 for a completely different purpose, and which neither teaches nor suggests any amplifier, adds nothing to Engel et al. regarding the recited thermistor of Claim 1, much less the recited thermistor and the recited amplifier of Claim 1.

Alpha, which does not teach or suggest any bimetal, clearly adds nothing to Engel et al. and Vlasak regarding any thermistor adapted to respond to a temperature of a bimetal. At best, Alpha teaches and suggests that a thermistor T1, much like the thermistor 70 of Vlasak, responds to ambient temperature (*e.g.*, to provide an amplifier output voltage of 200 mV at 25°C ambient temperature and 0 V at 45°C ambient temperature).

Therefore, for the above reasons, Claim 1 patentably distinguishes over the references.

The Examiner states that Vlasak "discloses a thermistor adapted to respond to the temperature of the bimetal (elements 37, 60 and 70 in Fig. 3, col. 4, lines 28-43, co[l]. 5, lines 25-47)." This statement is traversed for the reasons discussed above, since the reference clearly discloses at col. 5, ll. 32-35 (emphasis added) that the "outdoor ambient resistor 72 is normally fixed and in one embodiment may be 3.3K ohms. It is thermally linked to the thermostat bi-metal members." As was also discussed, the outdoor ambient compensating thermistor 70 "provides a control for the fixed resistor 72 to help provide little anticipation heat at low outdoor temperatures and significant anticipation heat at high outdoor temperatures." Again, current through the resistor 72 causes heat, which heats the thermostat bi-metal members 37,60. Hence, it is respectfully submitted that the Examiner's reliance upon Vlasak is misplaced.

As to Alpha, the Examiner states that it discloses "a first resistor connected between the second terminal of the bimetal and the first input of the amplifier (resistor R2 in Fig. 4)". This statement is traversed because Alpha does not teach or suggest any bimetal. Actually, at best, Alpha discloses a first resistor (R2) connected between the second terminal of a potentiometer (R3) and the first input (-) of an amplifier. Here, the express purpose of the potentiometer (R3) is to calibrate the circuit by adjusting the variable potentiometer for an output voltage of 200 mV at 25°C and 0 V at 45°C. Again, as was discussed above, the express purpose of the thermistor T1 is to respond to ambient temperature. Clearly, there is

no teaching or suggestion in Alpha that the thermistor T1 is to respond to the temperature of potentiometer (R3), much less any bimetal.

The Examiner concludes that "[a]s to the connection of the second input of the amplifier [of Alpha], according to Engel et al. reference, the second input of the arc detection circuit (element 23 in Fig. 1) is connected to the first input of the bimetal" and that "the second input of the amplifier will be connected to the first terminal of the bimetal." It is respectfully submitted that the Examiner's conclusion is based upon hindsight, which is clearly impermissible, and/or an erroneous analysis of both Vlasak and Alpha as was discussed above. There is no teaching or suggestion in Alpha that the thermistor T1 is to respond to the temperature of potentiometer (R3), much less any bimetal. Furthermore, both Alpha and Vlasak teach and suggest respective thermistors T1 and 70 that respond to ambient temperature. This clearly teaches away from a thermistor adapted to respond to a temperature of a bimetal. Since Engel et al. does not teach or suggest any thermistor, it is respectfully submitted that the Examiner impermissibly concludes by hindsight that "the second input of the amplifier [of Claim 1] will be connected to the first terminal of the bimetal."

The Examiner also concludes that "the output signal of the amplifier would be connected to the trip mechanism (element 13 in Fig. 1 of Engel et al.), thus providing the trip signal as a function of the output voltage of the amplifier." It is respectfully submitted that the Examiner's conclusion is based upon hindsight, which is clearly impermissible, and/or an erroneous analysis of both Vlasak and Alpha as was discussed above. Furthermore, the trip mechanism 13 of Engel et al. is actuated by persistent overcurrents that heat up the bi-metal 17 causing it to bend and release a latch 19, or by short circuit currents through the bi-metal 17 that magnetically attract an armature 21 that alternatively releases the latch 19. Hence, it is respectfully submitted that there is also an incorrect analysis of Engel et al..

Although the Examiner argues that Alpha deals with a linearized thermistor network, there is no teaching or suggestion in any of the references that this network be applied to any thermistor that responds to the temperature of a bimetal.

Accordingly, for the above reasons, Claim 1 patentably distinguishes over the references.

Claims 2-7 and 9 depend either directly or indirectly from Claim 1 and patentably distinguish over the references for the same reasons.

Furthermore, Claim 5 provides that the amplifier is an operational amplifier, and Claim 6 provides that the output of the operational amplifier provides a negative gain

with respect to the voltage of the bimetal. Since the references do not teach or suggest the refined recital of Claim 1, they clearly neither teach nor suggest the recital of Claims 5 and 6, which further distinguishes over the references.

As was discussed above, Alpha does not teach or suggest any bimetal. Hence, the Examiner's statements on page 7, first full paragraph, and page 10, first paragraph, of the Office Action are traversed on that basis.

Claim 10 is an independent claim, which recites, *inter alia*, a method of operating a circuit breaker comprising employing a bimetal having a temperature coefficient in series with separable contacts; heating the bimetal to a temperature by passing current through the series combination of the bimetal and the separable contacts; employing a thermistor having a first terminal and a second terminal to respond to the temperature of the bimetal; employing an amplifier having a first input, a second input and an output; electrically connecting a first resistor between the second terminal of the bimetal and the first input of the amplifier, electrically connecting a second resistor in parallel with the thermistor; electrically connecting a third resistor in series with the parallel combination of the second resistor and the thermistor; electrically connecting the series combination of the third resistor and the parallel combination of the second resistor and the thermistor between the first input of the amplifier and the output of the amplifier; referencing the second input of the amplifier to the first terminal of the bimetal; outputting a voltage from the output of the amplifier; providing a trip signal as a function of the voltage; and opening the separable contacts of the circuit breaker in response to the trip signal.

The references, whether taken alone or in combination, do not teach or suggest employing a thermistor to respond to a temperature of a bimetal, electrically connecting a first resistor between a second terminal of such bimetal and a first input of the recited amplifier of Claim 10, referencing a second input of such amplifier to a first terminal of such bimetal, outputting a voltage from an output of such amplifier, and providing a trip signal as a function of such voltage.

Engel et al. clearly does not teach or suggest any thermistor, much less employing a thermistor to respond to a temperature of a bimetal of Claim 10.

Vlasak, which discloses an outdoor ambient resistor 72 that is thermally linked to thermostat bi-metal members 37,60 and that cooperates with an outdoor ambient compensating, negative temperature coefficient (NTC) thermistor 70, in order to provide relatively little anticipation heat to the thermostat bi-metal members 37,60 at low outdoor temperatures and to provide relatively significant anticipation heat to such bi-metal members

37,60 at high outdoor temperatures, teaches away from employing any thermistor to respond to a temperature of a bimetal. In complete contrast, the ambient compensating thermistor 70 is physically located within outdoor ambient air and responds to changes in such outdoor ambient air and cooperates with the fixed resistor 72, which heats the thermostat bi-metal members 37,60 as a function of the outdoor temperature. Clearly, Vlasak, which employs the thermistor 70 for a completely different purpose, and which neither teaches nor suggests any amplifier, adds nothing to Engel et al. regarding the recited thermistor of Claim 10, much less the recited thermistor and the recited amplifier of Claim 10.

Alpha, which does not teach or suggest any bimetal, clearly adds nothing to Engel et al. and Vlasak regarding employing a thermistor to respond to a temperature of a bimetal. At best, Alpha teaches and suggests that a thermistor T1, much like the thermistor 70 of Vlasak, responds to ambient temperature (*e.g.*, to provide an amplifier output voltage of 200 mV at 25°C ambient temperature and 0 V at 45°C ambient temperature).

At best, Alpha discloses a first resistor (R2) connected between the second terminal of a potentiometer (R3) and the first input (-) of an amplifier. Here, the express purpose of the potentiometer (R3) is to calibrate the circuit by adjusting the variable potentiometer for an output voltage of 200 mV at 25°C and 0 V at 45°C. Again, as was discussed above, the express purpose of the thermistor T1 is to respond to ambient temperature. Clearly, there is no teaching or suggestion in Alpha that the thermistor T1 is to respond to the temperature of potentiometer (R3), much less any bimetal.

There is no teaching or suggestion in any of the references, whether taken alone or in combination, of electrically connecting a first resistor between a second terminal of a bimetal and a first input of the recited amplifier of Claim 10, and referencing a second input of such amplifier to a first terminal of such bimetal.

Accordingly, for the above reasons, Claim 10 patentably distinguishes over the references.

Claims 11-13 depend from Claim 10 and patentably distinguish over the references for the same reasons.

Furthermore, Claim 13 recites providing a negative gain from the output of the amplifier with respect to a voltage of the bimetal. Claim 13 further distinguishes over the references for similar reasons as were discussed above in connection with Claim 6.

Claim 14 is an independent claim, which recites, *inter alia*, a trip assembly comprising: a bimetal adapted for connection in series with separable contacts and adapted for heating by current flowing therethrough, the bimetal including a temperature, a

temperature coefficient, a first terminal, and a second terminal having a voltage; a thermistor adapted to respond to the temperature of the bimetal; an amplifier having a first input, a second input and an output; a first resistor electrically connected between the second terminal of the bimetal and the first input of the amplifier; a second resistor electrically connected in parallel with the thermistor; a third resistor electrically connected in series with the parallel combination of the second resistor and the thermistor, the series combination of the third resistor and the parallel combination of the second resistor and the thermistor being electrically connected between the first input of the amplifier and the output of the amplifier, the second input of the amplifier being referenced to the first terminal of the bimetal, the output of the amplifier having a voltage; and means for providing the trip signal as a function of the voltage of the output of the amplifier.

The references, whether taken alone or in combination, do not teach or suggest, *inter alia*, a thermistor adapted to respond to a temperature of a bimetal, a first resistor electrically connected between a second terminal of such bimetal and a first input of the recited amplifier of Claim 14, a second input of such amplifier being referenced to a first terminal of such bimetal, an output of such amplifier having a voltage, and means for providing a trip signal as a function of such voltage.

Engel et al. clearly does not teach or suggest any thermistor, much less any thermistor adapted to respond to a temperature of a bimetal of Claim 14.

Vlasak, which discloses an outdoor ambient resistor 72 that is thermally linked to thermostat bi-metal members 37,60 and that cooperates with an outdoor ambient compensating, negative temperature coefficient (NTC) thermistor 70, in order to provide relatively little anticipation heat to the thermostat bi-metal members 37,60 at low outdoor temperatures and to provide relatively significant anticipation heat to such bi-metal members 37,60 at high outdoor temperatures, teaches away from any thermistor adapted to respond to a temperature of a bimetal. In complete contrast, the ambient compensating thermistor 70 is physically located within outdoor ambient air and responds to changes in such outdoor ambient air and cooperates with the fixed resistor 72, which heats the thermostat bi-metal members 37,60 as a function of the outdoor temperature. Clearly, Vlasak, which employs the thermistor 70 for a completely different purpose, and which neither teaches nor suggests any amplifier, adds nothing to Engel et al. regarding the recited thermistor of Claim 14, much less the recited thermistor and the recited amplifier of Claim 14.

Alpha, which does not teach or suggest any bimetal, clearly adds nothing to Engel et al. and Vlasak regarding any thermistor adapted to respond to a temperature of a

bimetal. At best, Alpha teaches and suggests that a thermistor T1, much like the thermistor 70 of Vlasak, responds to ambient temperature (*e.g.*, to provide an amplifier output voltage of 200 mV at 25°C ambient temperature and 0 V at 45°C ambient temperature).

At best, Alpha discloses a first resistor (R2) connected between the second terminal of a potentiometer (R3) and the first input (-) of an amplifier. Here, the express purpose of the potentiometer (R3) is to calibrate the circuit by adjusting the variable potentiometer for an output voltage of 200 mV at 25°C and 0 V at 45°C. Again, as was discussed above, the express purpose of the thermistor T1 is to respond to ambient temperature. Clearly, there is no teaching or suggestion in Alpha that the thermistor T1 is to respond to the temperature of potentiometer (R3), much less any bimetal.

There is no teaching or suggestion in any of the references, whether taken alone or in combination, of a first resistor electrically connected between a second terminal of a bimetal and a first input of the recited amplifier of Claim 14, a second input of such amplifier being referenced to a first terminal of such bimetal, an output of such amplifier having a voltage, and means for providing a trip signal as a function of such voltage.

Hence, for the above reasons, Claim 14 patentably distinguishes over the references.

Claims 15-19 depend either directly or indirectly from Claim 14 and patentably distinguish over the references for the same reasons. Claim 19 further distinguishes over the references for similar reasons as were discussed above in connection with Claim 6.

Claim 20 is an independent claim, which recites, *inter alia*, a bimetal compensation circuit comprising: a thermistor adapted to respond to the temperature of the bimetal; an amplifier having an input and an output; a first resistor electrically connected between the second terminal of the bimetal and the input of the amplifier; a second resistor electrically connected in parallel with the thermistor; and a third resistor electrically connected in series with the parallel combination of the second resistor and the thermistor, the series combination of the third resistor and the parallel combination of the second resistor and the thermistor being electrically connected between the input of the amplifier and the output of the amplifier, the output of the amplifier having a voltage, which is compensated for the temperature coefficient of the bimetal.

The references, whether taken alone or in combination, do not teach or suggest, *inter alia*, a thermistor adapted to respond to a temperature of a bimetal, a first resistor electrically connected between a second terminal of such bimetal and an input of an

amplifier, and an output of such amplifier having a voltage, which is compensated for a temperature coefficient of such bimetal.

Engel et al. clearly does not teach or suggest any thermistor, much less any thermistor adapted to respond to a temperature of a bimetal of Claim 20.

Vlasak, which discloses an outdoor ambient resistor 72 that is thermally linked to thermostat bi-metal members 37,60 and that cooperates with an outdoor ambient compensating, negative temperature coefficient (NTC) thermistor 70, in order to provide relatively little anticipation heat to the thermostat bi-metal members 37,60 at low outdoor temperatures and to provide relatively significant anticipation heat to such bi-metal members 37,60 at high outdoor temperatures, teaches away from any thermistor adapted to respond to a temperature of a bimetal. In complete contrast, the ambient compensating thermistor 70 is physically located within outdoor ambient air and responds to changes in such outdoor ambient air and cooperates with the fixed resistor 72, which heats the thermostat bi-metal members 37,60 as a function of the outdoor temperature. Clearly, Vlasak, which employs the thermistor 70 for a completely different purpose, and which neither teaches nor suggests any amplifier, adds nothing to Engel et al. regarding the recited thermistor of Claim 20, much less the recited thermistor and the recited amplifier of Claim 20.

Alpha, which does not teach or suggest any bimetal, clearly adds nothing to Engel et al. and Vlasak regarding any thermistor adapted to respond to a temperature of a bimetal. At best, Alpha teaches and suggests that a thermistor T1, much like the thermistor 70 of Vlasak, responds to ambient temperature (*e.g.*, to provide an amplifier output voltage of 200 mV at 25°C ambient temperature and 0 V at 45°C ambient temperature).

At best, Alpha discloses a first resistor (R2) connected between the second terminal of a potentiometer (R3) and the input (-) of an amplifier. Here, the express purpose of the potentiometer (R3) is to calibrate the circuit by adjusting the variable potentiometer for an output voltage of 200 mV at 25°C and 0 V at 45°C. Again, as was discussed above, the express purpose of the thermistor T1 is to respond to ambient temperature. Clearly, there is no teaching or suggestion in Alpha that the thermistor T1 is to respond to the temperature of potentiometer (R3), much less any bimetal.

There is no teaching or suggestion in any of the references, whether taken alone or in combination, of a first resistor electrically connected between a second terminal of a bimetal and an input of the recited amplifier of Claim 20, and an output of such amplifier having a voltage, which is compensated for a temperature coefficient of such bimetal.

Therefore, for the above reasons, Claim 20 patentably distinguishes over the references.

Claim 8 is rejected as being unpatentable over Engel et al. in view of Vlasak in view of Alpha and further in view of U.S. Patent No. 3,593,249 (Sedgwick).

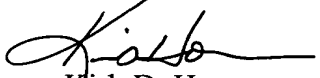
Sedgwick discloses a circuit breaker including a bimetal strip 29 and an ambient compensating bimetal strip 28.

Sedgwick, which discloses bimetal strips 28,29, but which does not teach or suggest any thermistor or amplifier, adds nothing to Engel et al., Vlasak and Alpha to render Claim 1 unpatentable.

Claim 8 depends from Claim 1 and patentably distinguishes over the references for the same reasons.

Reconsideration and early allowance are requested.

Respectfully submitted,



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